Title: Nonlinear optical frequency conversion of few-cycle laser pulses

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Abstract: The goal of the thesis was to achieve generation of second harmonic frequency from ultrashort laser pulses with central wavelength of 780 nm and to compress the generated pulses to the shortest possible time duration. We have studied and optimized the efficiency of second harmonic frequency generation from wide spectrum laser, which generates ultrashort pulses with a duration of few femtoseconds. Firstly we have developed and optimized the experimental setup for the highest power output of the generated second harmonic frequency pulses. Afterwards we measured the duration of the generated pulses using nonlinear optical cross-correlation with the pulses at the fundamental frequency generated by the laser. Cross-correlation was obtained from sum frequency generation in a thin nonlinear BBO crystal. The pulses at the second harmonic frequency were compressed to a duration of 13 femtoseconds by combining wide spectrum mirrors with negative dispersion of group velocities and thin fused silica wedges. These ultrashort pulses will be used in experiments with high time resolution in the future.

Keywords: Femtosecond laser pulses, nonlinear optics, spectral phase of ultrashort pulses, second harmonic frequency generatio